

**REMARKS**

Claims 12-16 are pending in this application. New claim 16 has been added. No new matter has been introduced and no new issues have been raised.

The rejections of claims 12-15 are addressed below, in the order presented in the November 3, 2006 Office Action.

**Claims 12-15 Comply With 35 U.S.C. § 112, First Paragraph**

Claims 12-15 are rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. This rejection is respectfully traversed.

Applicants disagree with the Examiner's assertion that the original application does not support the limitation "the concentration of dimethyl ether is between 30 and 68% w/w, and the concentration of water is between about 14 and 40% w/w," as recited in claim 12. (November 3, 2006 Office Action at 3). Applicants further disagree with the Examiner's assertion that "[A]pplicant provides an example using 100 g of methanol at 50% conversion to explain how the disputed limitations were reached" and that "[T]his example is not set forth in the specification and does not provide support for the claimed limitation." (November 3, 2006 Office Action at 3).

According to Federal Circuit case law, "the disclosure need only reasonably convey to persons skilled in the art that the inventor had possession of the subject matter in question." See Fujikawa v. Wattanasin, 93 F.3d 1559, 1570 (Fed. Cir. 1996); See also In re Alton, 76 F.3d 1168, 1175 (Fed. Cir. 1996) ("If a person of ordinary skill in the art would have understood the inventor to have been in possession of the claimed invention at the time of filing, even if every nuance of the claim is not explicitly described in the specification, then the adequate written description requirement is

met."); Monsanto Co. v. Mycogen Plant Science, Inc., 61 F. Supp. 2d 133, 188 (D. Del. 1999) ("The applicant need not describe the subject matter claimed in exact terms."); See also Ralston Purina Co. v. Far-Mar-Co., 772 F.2d 1570, 1575 (Fed. Cir. 1985); Plastic Container Corp. v. Continental Plastics of Oklahoma, Inc., 607 F.2d 885, 886 (10<sup>th</sup> Cir. 1979). In fact, the law "does not require . . . an example to satisfy the written description requirement." Flehmig v. Giesa, 13 U.S.P.Q.2d 1052 (Bd. Pat. App. & Int'f 1989).

In the present case, the specification reasonably conveys to one skilled in the art that Applicants had possession at the time of filing of the subject matter of claim 12. Applicants submit that the calculations provided on pages 4-5 of the June 29, 2006 Amendment contain four examples, and not one example, as the Examiner asserts. The four examples that were given are summarized as follows: 50% and 95% conversion of pure methanol, and of 80% methanol with 20% water, resulting in 14, 26, 31, and 41 wt% water; 36, 68, 29, and 55 wt% DME; and 50, 5, 40, and 4 wt% methanol, respectively, giving the limits of 14 to 41 wt% water, 30 to 68 wt% DME, and 5 to 50 wt% methanol given in claim 12. For at least this reason, the disclosure reasonably conveys to persons skilled in the art that the inventors of the present application had possession of the subject matter of claims 12-15 at the time the application was filed.

Applicants also submit that all fuels of the present invention are equilibrium compositions from methanol and possibly some water and/or other alcohols. The data given in the original specification enable a person skilled in the art to calculate the limitations of claim 12, i.e., the concentrations of dimethyl ether and water in a mixture obtained by dehydrating methanol or methanol with up to 20 wt% water. Accordingly, the specification enables a person skilled in the art to carry out the invention recited in claimed invention, and the original application supports the limitation "the concentration of dimethyl ether is between 30 and 68% w/w, and the concentration of

water is between about 14 and 40% w/w.” Withdrawal of the rejection of claims 12-15 under 35 U.S.C. § 112 is respectfully requested.

**Claims 12-15 Are Patentable Over The Cited Prior Art References**

Claims 12-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Basu et al. (U.S. Patent No. 6,270,541) (“Basu”) in view of Applicants’ admitted prior art (APA), Ford Vehicles, Mendler (U.S. Patent No. 6,1125,801) and Ceynow (U.S. Patent No. 5,440,880). This rejection is respectfully traversed.

The claimed invention relates to a method of operating a compression ignition engine with a diesel fuel composition (comprising methanol, dimethyl ether and water in specific amounts) by injecting the fuel into the combustion chamber of the engine and combusting the fuel with air preheated to a temperature of at least 60°C. As such, independent claim 12 recites a “method of operating a compression ignition engine on an oxygenated diesel fuel composition comprising methanol, dimethyl ether and water.” Independent claim 12 also recites “injecting the fuel into the combustion chamber of the engine and combusting the fuel with air, wherein the concentration of methanol is between 5 and 50% w/w, the concentration of dimethyl ether is between 30 and 68% w/w, and the concentration of water is between about 14 and 40% w/w, and wherein the air for combustion is preheated to a temperature of at least 60°C.”

The subject matter of claims 12-15 would not have been obvious over Basu, APA, Ford Vehicles, Mendler and Ceynow, considered alone or in combination. Specifically, the Office Action fails to establish a *prima facie* case of obviousness. Courts have generally recognized that a showing of a *prima facie* case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to

modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. See e.g., In re Dembiczak, 175 F.3d 994 (Fed. Cir. 1999); In re Rouffet, 149 F.3d 1350, 1355 (Fed. Cir. 1998); Pro-Mold & Tool Co. v. Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996).

In the present case, the cited prior art references, considered alone or in combination, fail to disclose, teach or suggest “injecting the fuel into the combustion chamber of the engine and combusting the fuel with air, wherein the concentration of methanol is between 5 and 50% w/w, the concentration of dimethyl ether is between 30 and 68% w/w, and the concentration of water is between about 14 and 40% w/w, and wherein the air for combustion is preheated to a temperature of at least 60°C,” as claim 12 recites.

First, Basu does not disclose, teach or suggest a fuel comprising from 30 to 68 wt% dimethyl ether, from 5 to 50 wt% methanol and from 14 to 40 wt% water. The fuel composition of Basu comprises from 70 to 95 wt% dimethyl ether, up to 20 wt% methanol and from 0.1 to 20 wt% water. (Abstract). In contrast, the fuel used in the present invention comprises from 30 to 68 wt% dimethyl ether, from 5 to 50 wt% methanol and from 14 to 40 wt% water.

Second, Basu teaches against lowering the concentration of dimethyl ether (i.e., against lowering the 70 to 95 wt% dimethyl ether interval), as concentrations of dimethyl ether lower than 70 wt% affect the properties of the diesel fuel. In this respect, Basu clearly emphasizes that “[I]f the alternative diesel fuel composition of the present invention contains less than about 70 weight percent of dimethyl ether, the problems of poor ignition characteristics and of separation of the diesel fuel into two liquid phases result and prohibit the composition from being used effectively as a

diesel fuel.” Thus, Basu teaches against lowering the concentration of dimethyl ether and, in view of the teachings of Basu, a person skilled in the art would not have been motivated to read the term “about 70 wt%” as encompassing “68 wt%.”

Applicants also point out that the crux of Basu is addressing the problem of polluting exhaust gas by using a fuel, which contains from 70 to 95 wt%, preferably from 85 to 93 wt% DME. For this, Basu uses an engine with an intercooler as its only example, and as a preferred example Basu uses additives (column 4, lines 40 to 44). Basu also points out that “if too much methanol is present in the mixture containing a particular concentration of water, the ignition characteristics of the mixture are adversely affected.” (Col. 3, ll. 60-65). Accordingly, a person skilled in the art would expect from this teaching that more methanol and less DME would not improve the performance of a diesel engine. Thus, one skilled in the art would not have been motivated to lower the 70 to 95 wt% interval of Basu below the 70 wt% lower limit, or to read the term “about 70 wt%” as encompassing “68 wt%.”

Basu, APA, Ford Vehicles, Mendler and Ceynow, alone or in combination, also fail to disclose, teach or suggest the step of preheating the air for combustion to a temperature of at least 60°C, as claim 12 recites. Basu is silent about preheating the air for combustion to a temperature of at least 60°C. Basu discloses a diesel fuel composition comprising methanol, dimethyl ether, and water for operating a diesel engine, but not that the air for combustion is preheated to a temperature of at least 60°C. The fact that Basu mentions an intercooler or an EGR system does not mean that Basu suggests heating the combustion air. In fact, Basu teaches an air-to-air intercooler, such that the combustion air is cooled by ambient air *before* it is introduced to the combustion chamber of the engine. Consequently, the description of the engine in Basu does not disclose, teach or suggest to heat combustion air before it is introduced to the

combustion chamber. Basu is also completely silent about heating combustion air with exhaust gas.

The Examiner's reliance upon the teachings of Mendler and Ceynow to establish the preheating of the air for combustion to a temperature of at least 60°C is misplaced. A person skilled in the art would not have been motivated to combine the teachings of Basu with those of Mendler to arrive at the subject matter of claims 12-15. Basu

Basu discloses a diesel fuel composition comprising methanol, dimethyl ether, and water for operating a diesel engine. On the other hand, Mendler is concerned with an improvement of the efficiency of a spark-ignition internal combustion engine. Fuel compositions for diesel engines and the operation conditions for diesel engines are different from fuel compositions for spark-ignition engines and the operation conditions for such spark ignition engines. Therefore, there is no motivation for one skilled in the art to combine the teachings of Basu and Mendler. A person skilled in the art would also not have been motivated to combine Basu, which teaches a specific diesel fuel composition having methanol, dimethyl ether and water, with Mendler, which teaches adjustable fuel/air ratios for spark-ignition internal combustion engines.

A person of ordinary skill in the art would also not have been motivated to combine Basu and Mendler with Ceynow, to arrive at the claimed invention. Ceynow discloses an EGR system where some of the exhaust gas is recirculated and introduced in the fresh combustion air. After the exhaust gas is mixed with the combustion air, this combined stream is cooled in an after-cooler. The problem of soot deposit on the surface of the after-cooler is solved by installing a catalytic filter in the exhaust gas recycle stream (i.e., Ceynow describes another problem/solution). By this EGR system,

oxygen-depleted exhaust gas is mixed into the fresh combustion air, and the air composition is changed. Accordingly, in order to use a diesel fuel with a high content of DME and to clean an exhaust gas stream, adding it to an air intake stream and cooling the combined stream, a person skilled in the art would not have been motivated to select a diesel fuel which is an equilibrium composition and has a lower content of DME and to pre-heat the unmixed combustion air possibly by heat exchange with exhaust gas as the heating medium, in order to obtain lower consumption figures and lower contents of NO<sub>x</sub>, HC and CO in the exhaust gas. For at least these reasons, the Office Action fails to establish a *prima facie* case of obviousness, and withdrawal of the rejection of claims 12-15 is solicited.

**Comments On Examiner's Remarks In The November 3, 2006 Office Action**

In the November 13, 2006 Office Action, the Examiner asserts that additional comparative data is necessary to compare the performance of the fuel proposed by Basu with that of the fuel of the present invention. Applicants submit that Table 9 of the present application discloses test results of fuels with 0% and 100% DME as reference fuels. 100% must in this connection be close to 95% DME, which is a composition of Basu. The following is demonstrated by the results summarized in Table 9:

With 60% or less DME in an equilibrium composition fuel, the NO<sub>x</sub> content in the exhaust gas is drastically reduced, to less than a tenth. For a certain fuel composition of the invention, an increase in combustion temperature will decrease the fuel consumption and the content of CO and incompletely combusted hydrocarbons in the exhaust gas. These advantages of the present invention are neither suggested nor rendered obvious by the cited prior art. Therefore, the claimed subject matter is also based on an inventive step.

Basu teaches a fuel composition which contains from 70 to 95 wt% DME, and which is different from the range of from 30 to 68 wt% recited in claim 12. Moreover, 68 wt% is an upper limit and 70 wt% is a lower limit of an interval considerably bigger than the difference between 68 and 70 wt%. In Table 9 of the present specification, the highest content of DME is 60 wt%.

In view of the above remarks, allowance of all pending claims 12-16 is solicited.

Dated: February 1, 2007

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